

1. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation, comprising:

Sub (1) wetting the surface of the semiconductor wafer by using a non-splash rinse technique, the non-splash rinse technique being configured to quickly and evenly saturate the surface of the semiconductor wafer.

2. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, further comprising:

after the plasma etching operation and before the operation of wetting the surface of the semiconductor wafer, keeping the semiconductor wafer substantially dry.

3. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, further comprising:

after the operation of wetting the surface of the semiconductor wafer, scrubbing the surface of the semiconductor wafer with a cleaning brush that applies a chemical solution to the surface of the wafer.

4. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 3, wherein the cleaning brush is a first cleaning brush and the wetting and the scrubbing operations are performed in a brush box, the brush box having the first cleaning brush and a second cleaning brush, and the second cleaning brush being implemented to scrub a bottom surface of the wafer.

5. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 3, wherein the cleaning brush is a first cleaning brush,

the wetting operation is performed in a first brush box and the scrubbing operation is performed in a second brush box, the second brush box having the first cleaning brush and a second cleaning brush, and the second cleaning brush being implemented to scrub a bottom surface of the wafer.

81 6. (Amended) A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, wherein the operation of wetting the surface of the semiconductor wafer comprises:

setting a first delivery source and a second delivery source over the surface of the wafer in order to wet the surface of the wafer at a flow rate of water; and
setting the flow rate to be between about 50 ml/minute and about 300 ml/minute.

7. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 6, wherein the operation of wetting the surface of the semiconductor wafer further comprises:

setting a time of less than about 4 seconds to wet substantially all of a top surface of the semiconductor wafer.

8. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, wherein the operation of wetting the surface of the semiconductor wafer comprises:

rotating the semiconductor wafer about a radial axis at a rate of between about 2 revolutions per minute and about 20 revolutions per minute.

9. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, wherein the semiconductor wafer is disposed completely inside a brush box, and no wafer other than the semiconductor wafer that is inside the brush box is exposed to liquid by the wetting operation.

10. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, wherein the wetting operation occurs inside a brush box that does not have an entrance spray.

11. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, wherein the wetting operation occurs inside a brush box, and a spin, rinse, and dry (SRD) operation is not performed on the semiconductor wafer after the plasma etching operation and before the wetting operation.

21. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation, comprising:

wetting the surface of the semiconductor wafer by using a non-splash wetting technique, the non-splash wetting technique including setting an outlet end of at least one delivery source over the surface of the semiconductor wafer at an angle in a range from about 5 degrees to about 35 degrees relative to the surface of the wafer, and applying liquid to the surface of the semiconductor wafer through the outlet end of the at least one delivery source.

22. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 21, wherein the non-splash wetting technique further includes:

setting the outlet end of the at least one delivery source to overlie an edge of the semiconductor wafer by a distance in a range from about 2 mm to about 30 mm.

23. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 21, wherein deionized water is applied to the surface of the semiconductor wafer through the outlet end of the delivery source at a flow rate between about 50 ml/minute and about 300 ml/minute.

24. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 21, wherein the plasma etching operation is a tungsten etch-back (WEB) operation.

25. A method for cleaning a surface of a semiconductor wafer, comprising:
receiving a semiconductor wafer that has been subjected to a plasma etching operation;

positioning an outlet end of at least one liquid delivery source relative to a surface of the semiconductor wafer so that the outlet end overlies an edge of the semiconductor wafer by a distance in a range from about 2 mm to about 30 mm, the outlet end is oriented at an angle in a range from about 5 degrees to about 35 degrees relative to the surface of the semiconductor wafer, and the outlet end is disposed above the surface of the semiconductor wafer by a distance in a range from about 2 mm to about 15 mm; and

applying liquid to the surface of the semiconductor wafer through the outlet end of the at least one liquid delivery source.

26. The method of cleaning a surface of a semiconductor wafer of claim 25, wherein the liquid is comprised of deionized water.

27. The method of cleaning a surface of a semiconductor wafer of claim 25, wherein the liquid is applied to the surface of the semiconductor wafer through the outlet end of the at least one liquid delivery source at a flow rate between about 50 ml/minute and about 300 ml/minute.

28. The method of cleaning a surface of a semiconductor wafer of claim 25, wherein the liquid is applied to the surface of the semiconductor wafer as the semiconductor wafer rotates about a radial axis at a rate of about 2 revolutions per minute to about 20 revolutions per minute.

29. The method of cleaning a surface of a semiconductor wafer of claim 25, wherein the outlet end of the at least one liquid delivery source overlies the edge of the semiconductor wafer by a distance of about 5 mm.

30. The method of cleaning a surface of a semiconductor wafer of claim 25, wherein the outlet end of the at least one liquid delivery source is oriented at an angle of about 15 degrees relative to the surface of the semiconductor wafer.

31. The method of cleaning a surface of a semiconductor wafer of claim 25, wherein the outlet end of the at least one liquid delivery source is disposed about 7 mm above the surface of the semiconductor wafer.